

Overview on SARS in Asia and the World

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Severe Acute Respiratory Syndrome (SARS) is the first major novel infectious disease to hit the international community in the 21st century. It originated in southern China in November 2002, reached Hong Kong in February 2003 and spread rapidly thereafter to 29 countries/regions on five continents. At the end of the epidemic, the global cumulative total was 8098 with 774 deaths. Seven Asian countries/regions were among the top ten on the list. Mainland China and Hong Kong, SAR, accounted for 87% of all cases and 84% of all deaths. Severe acute respiratory syndrome is caused by a novel coronavirus. It has alarmed the world with its infectivity and significant morbidity and mortality, its lack of a rapid, reliable diagnostic test and lack of effective specific treatment and vaccination. The adverse impact on travel and business around the world, particularly in Asia, has been enormous.

Some lessons learnt from this epidemic included: (1) any outbreak of infectious disease can rapidly spread around the world by air travel; (2) early reporting of the outbreak to neighbouring countries/regions and the World Health Organization is essential to prevent international spread; and (3) infection control, tracing and quarantine of contacts are essential to control the epidemic. Many questions remain unanswered, including the origin and pathogenesis of the novel coronavirus, the natural history and the best specific treatment of the disease. The SARS-CoV has probably jumped from an animal host to humans. There is an urgent need to evaluate the human–animal habitat in southern China and to remove animal reservoirs if found.

Key words: global impact, severe acute respiratory syndrome, tracing and quarantine.

THE OUTBREAK AND IMPACT ON HEALTH

Severe Acute Respiratory Syndrome (SARS) is the first major novel infectious disease to hit the international community, particularly in Asia, in the 21st century.

The outbreak probably started in November 2002 when the first reports of a highly contagious, severe atypical pneumonia of unknown origin appeared in the Guangdong Province of southern China.¹ Right from the start, the rapid spread of the infection to involve clusters of health care workers attending these patients in Guangdong was noted.^{1–2} It began to spread around the world when an infected medical doctor from Guangdong arrived in Hong Kong on 21 February 2003 and infected not only his brother-

in-law and health care workers in Hong Kong, but also sixteen other guests staying on the same floor of the hotel where he stayed, who returned home and in turn led to outbreaks in Hanoi, Singapore and Toronto.^{3–7} It did not catch the attention of the international community until 12 March 2003 when the World Health Organization (WHO) issued a global alert about this new infection after receiving reports from Guangdong, Hong Kong and Hanoi, and increased the level of the global alert on 15 March 2003 after receiving more reports from Singapore and Toronto.^{8,9} It named the new infectious disease severe acute respiratory syndrome (SARS) for want of knowledge of its aetiology, and declared that SARS was a worldwide health threat. How right the WHO was! From about 150 reported cases around the world outside the mainland of China on that date, the case numbers rapidly increased to 1500 by the end of March, surpassed 3000 on 14 April, 5000 on 28 April and 7000 on 8 May. By 31 July 2003 at the end of the global epidemic, there were 8098 cumulative number of cases with 774 deaths in 29 countries and regions on five continents.¹⁰ Of the 10 countries or regions

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heading the cumulated numbers of cases, seven are in Asia (the mainland of China, Hong Kong, Taiwan, Singapore, Vietnam, Philippines and Thailand). The Mainland of China (5327 cases with 349 deaths) and Hong Kong (1755 cases with 299 deaths) together already accounted for 87% of all cases and 84% of all deaths.

With modern technology and concerted international effort, the medical and scientific community quickly responded to this completely new infection. By early April, 2003, scientists from Canada, Centres for Diseases Control and Prevention (CDC), Hong Kong and Europe had each identified a novel coronavirus never described before to be the causative agent for SARS,^{6,11-13} which was confirmed by the WHO on April 16, 2003 and was named SARS-CoV.¹⁴ The first isolated coronavirus in Guangzhou, which is only 250 km away from Hong Kong, was confirmed on April 12, 2003. The virus isolated from Guangzhou patients is the prototype of the SARS-CoV found in Hong Kong and countries around the world.¹⁵ Two to three weeks later, these scientists, and also those from Singapore, had independently sequenced the genome of the SARS-CoV.¹⁶⁻¹⁸

THE SPREAD AND IMPACT ON TRAVEL AND ECONOMY

It was apparent even early on that SARS could easily spread across countries and regions by air and by other means of travel in this modern, globalization age. This is well illustrated by the example of infected guests in the affected Hong Kong hotel bringing SARS back to their home countries of Singapore, Vietnam and Canada, as mentioned earlier. Another example was the CA112 flight from Hong Kong to Beijing on 15 March 2003 on which a symptomatic passenger infected no less than nine tourists from Hong Kong to Beijing, three Taiwanese businessmen, one Singaporean and four Chinese. Since then, the WHO has issued guidelines on tight port control measures including temperature checks and health and contact screening forms for all passengers and crew.¹⁹ The WHO has also regularly issued advice against non-essential travel to places badly affected by SARS, and the lists of countries/regions with recent local transmission of SARS was regularly updated and widely publicized.²⁰

Severe acute respiratory syndrome has not only caused enormous suffering in patients and families, but has also had profound impact on the economy. There is an immense global anxiety and even fear generated towards SARS. This is due to a number of reasons. The largely unknown nature of the novel infection; the lack of a rapid and reliable diagnostic test, effective treatment and vaccination; its alarming infectivity especially via superspreaders and in health care workers and families; the large number of relatively young and previously healthy people infected; the significant morbidity and ICU admission rate and the mortality of the disease have all contributed to the intense global anxiety. Furthermore, the very high profile that resulted from WHO and CDC travel advice and their listing of areas with recent local transmission of the disease; the tight and threatening quarantine policy and port infection control measures, and the intensive and often sensational media coverage of the disease with the closing down of hospitals, schools and wholesale markets, and with pictures of 'cities on the masks' have all imposed a tremendous adverse effect on travel and business around the world, and particularly in Asia.

During the peak of the SARS epidemic in May 2003, aircraft movement at the Hong Kong International Airport plunged by 49%,²¹ and hotel occupancy rate dropped to an all time low level of 17% against a 83% rate in May 2002.²² Similarly, Singapore Airlines and airlines in the mainland of China cancelled 50% and 78% of their flights.²³ The setback on tourism, business and the economy was enormous.

Following the intense effort of local health authorities in the areas of isolation and quarantine control and following concerted international efforts in enhancing airport screenings, together with increasing knowledge of the disease and proper health education on personal hygiene, the SARS epidemic rapidly came under control in June 2003. One after the other, the major affected countries and regions were removed from the list of areas with recent local transmission of SARS (Table 1).²⁰ Travel advice against non-essential travel was also lifted. On 5 July 2003, the last affected area (Taiwan) was declared free of SARS transmission, indicating that all known chains of person-to-person transmission of the SARS virus had been broken, just slightly more than four months after SARS had begun to spread worldwide (late February 2003). This removal of travel advice and the clearing of all areas from SARS transmission has

Table 1 WHO travel advisory and label as 'areas with recent local transmission'²⁰

Region	Travel advisory		Areas with local transmission	
	Date effective	Date lifted	Date labelled	Date removed
Hanoi	—	—	March 16	April 28
Hong Kong	April 2	May 23	March 16	June 23
Singapore	—	—	March 16	May 31
Beijing	April 23	June 24	March 27	June 24
Toronto	April 23	April 30	March 16	May 14
			May 26	July 2
Taiwan	May 21	June 17	March 18	July 5

brought about great improvement in the sentiments of consumers, travellers and business operators, and signs of recovery in travel and related business were already apparent in June and July 2003. In July 2003, Hong Kong's Cathay Pacific Airline and airlines in the mainland of China have recorded rises in passenger traffic to 70% and 80% of pre-SARS levels respectively, with corresponding improvement in related business.

UNANSWERED QUESTIONS

The SARS epidemic has come and gone, at least for the time being. A number of questions remain unanswered. The origin of the new virus, its modes of transmission other than by droplets and fomites, its infectivity during its incubation period and after clinical recovery, and its natural history are all unknown. We need also to define its pathogenesis and the host reactions to the virus in order to establish the most effective treatment, if any, for this new disease. Current treatments are empirical and not based on randomized control trials. Whether it has become an endemic disease that will return in winter will also need to be established. Further studies on its molecular characteristics hopefully will help to unwind many of its mysteries and to develop effective, targeted therapy and vaccines.

REVELATIONS AND LESSONS

This new infection has generated a number of revelations and taught us a number of lessons. First, SARS is of great global significance. It provides a warning that in this age of globalization and heavy international air traffic, any outbreak of infectious disease can rapidly spread around the world to cause a severe adverse impact on health and economy, and must be dealt with by a concerted international effort. Second, the WHO is in a unique position to alert international health authorities, coordinate international medical, scientific and educational efforts and to disseminate information and advice. It is sobering to reflect that it took several years for scientists to isolate the HIV virus and to sequence its genome. The agent responsible for SARS was isolated within a few weeks due to the fact that scientists from 11 laboratories put aside their competitiveness and worked together under the WHO's leadership (together with advances in modern technology, of course). It is hoped that this will serve as a model for any future infectious disease outbreak to facilitate control and prevention of communicable diseases. Third, the outbreak has shown clearly that early reporting of an outbreak of infectious disease to neighbouring countries/regions and the WHO, together with early implementation of appropriate infection control and quarantine measures, is essential for containment and control of the infection. Fourth, we need to revisit the human-animal habitat. The SARS coronavirus is believed to have jumped from an animal host to people. The closeness between man and animals in southern China could provide an ecosystem for the interaction of their viruses and

increase the likelihood that two strains will recombine genetically to produce a deadly new variant. An excellent example is provided by the avian flu. A recent study has detected SARS-CoV-like viruses in Himalayan palm civets, a raccoon-dog and humans in the same live-animal market in Guangdong, southern China.²⁴ Although the animal reservoir of SARS-CoV is not entirely clear, we need to revisit the eating habit (wild game) and lifestyle in Hong Kong and southern China. Finally, medical scientists and health care professionals in the Asian Pacific region have shown that they can stand up to the challenge of completely newly emerging infections. They have fought bravely to contain the disease and have contributed significantly to detecting the causative virus.

We must remain vigilant as SARS has repeatedly demonstrated its resilience with the brief resurgence of cases in Toronto and most recently suspected cases in British Columbia in Canada in mid-August 2003 and a confirmed case in Singapore announced on 9 September 2003. The WHO has recommended that even without new case resurgence, we should have at least a full year of surveillance to determine whether the disease has established itself as an endemic disease.²⁵ Let us all remain on guard.

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